





ABSOLUTE REST



1669









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OF  
Absolute Rest  
IN  
BODIES.

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LONDON,

Printed for *Henry Herringman* at the *Blew Anchor* in the  
Lower Walk of the *New-Exchange*, MDC LXIX.

OF THE  
RIGHTS  
OF  
Absolute Right

IN  
BODIES

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LONDON

Printed for Henry Hargrave at the New Theatre, in  
Lower Wall in the New Exchange, LONDON.



AN  
ADVERTISEMENT.

**S***ince it hath not been thought amiss that something should be intimated to the Reader about the Occasion of the ensuing Tract, I shall acquaint him with it as briefly as I can, by telling him that it was This. Some very ingenious Gentlemen hapning to meet as Visitants at the Authors Lodgings, fell accidentally into a Discourse about the Absolute Rest supposed to be in many Bodies, that seem'd to have its Rise from a mistake of the true meaning of a passage or two in the History of Fluidity and Firmness (that was then re-printing) But the Conference chancing to have a period put to it, whilst several things pertinent to the Author's purpose remained yet unsaid: the Curiousness of the Subject invited him to draw up (hastily enough) the Sum of what he had said, and might further have said if opportunity had serv'd, about the Point in debate, for the further satisfaction of an inquisitive Virtuoso that was present at it. And this was the Rise of the following Discourse, which being written on an Occasion administred by the History of Fluidity and Firmness, whereof a New Edition was ready to come abroad; 'twas not thought improper that this Tract should attend it, as a kind of Appendix, without the First and Last part of a Letter, whereof the Body only is necessary to the Design of it.*



# ADVERTISEMENT

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The undersigned, having been appointed by the  
Board of Directors of the Bank of the City of New York,  
to receive and take care of the said Bank's  
affairs, and to see that the same are conducted  
in conformity with the Charter and By-Laws  
of the said Bank, do hereby certify that the  
same are being conducted in conformity with  
the said Charter and By-Laws, and that the  
Bank is now in a state of liquidation, and  
that the assets of the said Bank are being  
sold, and the proceeds thereof are being  
distributed to the holders of the said Bank's  
stock, in conformity with the said Charter  
and By-Laws. In testimony whereof, the  
undersigned have hereunto set their hands  
and seals, at the City of New York, this  
first day of January, 1857.



AN  
 ESSAY  
 Of the  
 INTESTINE MOTIONS  
 Of the  
 PARTICLES  
 OF  
 QUIESCENT SOLIDS.

Where the Absolute Rest of Bodies is called  
 in Question.

SECT. I.

**T**O remove the Doubt or Scruple that began to be discoursed of just before we last parted, I shall need to do little more than enlarge the Particulars, which (you know) I had then time but briefly to make mention of. For the state of the Question was, (as you may remember) this, *Whether there be among Bodies*

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any *absolute Rest*? On which occasion I answered, That *Rest* being a word that to me seem'd somewhat ambiguous, I thought 'twas requisite to clear the sense of the Question before I offer'd at answering it.

For the word *Rest*, when we speak of distinct Masses of Matter, lookt upon as quiescent, does in the vulgar acception of the Term signifie, such a state of a visible and entire Body, or (rather) of the Corpuscles it consists of, that they are actually *Unmoved as to sight*; the Eye (and perhaps not the Touch) being not able to discern any local Motion in them.

Consonantly to this first Member of the distinction of the word *Rest*, I briefly intimated to the Company, that in this sense of a Corpuscles being at *Rest*, I thought it manifest, that there is such a thing in *Rerum Natura*: Since without granting such a *Rest* in the component Particles of some kind of Bodies, as Diamonds, Iron, Porphyry, &c. 'twill be (I conceive) very hard to explain, how there can be such solid Masses (as those Minerals are) made up of small and separable Particles. Which being said, I added, that I saw no reason why such a kind of firmness, where the inward motion of the insensible Particles is almost infinitely slow, may not suffice to give an account of as great a firmness as we use really to find among consistent Bodies.

But whereas I had intimated to the Company, by the lately begun Distinction, that besides this popular sense of the word *Rest*, there was a second, more rigid and Philosophical Notion, or kind of *Rest*, which for distinction sake may be called *Absolute* or *Perfect Rest*; which imports a continuance of a Body in the same place *precisely*, and includes an absolute Negation of all local Motion, though never so slow or imperceptible; I told them that in this rigid sense of the word *Rest*, I durst not affirm, that there are any Bodies at *Rest* in the

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Universe (at least for any long time) but willingly allowed it to be made a Problem, whether there be any or no: adding, that perhaps I inclin'd to the Negative part of the Question.

Having thus historically summ'd up what pass'd betwixt us about the state of the Controversie, I need not tell you, that the Doubt I express'd was thought to relish too much of a Paradox; and therefore since the company's quick separation allow'd me then no opportunity of enlarging, and since I promis'd no better Arguments than might be expected in a point that I propos'd but as Problematical; I shall now endeavour to shew you that the side of the Problem I was judg'd inclin'd to, is (at least) not so improbable as some thought it.

To prove Negatives directly, being wont (as you well know) to be no easie Task, and especially in such cases as this; you will not, I presume, expect that I should attempt the proving of my Conjecture otherwise than by shewing positively, that some of those Bodies which we think to have their parts most at Rest, are not exempted from having Intestine Motions in them; since 'twill be consequent to such a proof, that it must be probable, that in other Bodies whose Solidity is confessed to be inferiour, the component Particles are not in a state of Perfect Rest.

## SECT. II.

If it were necessary and expedient, I should begin my Arguments by saying something against Absolute Rest, in favour of the contrary Opinion, by arguing, *à Priori*, as they speak, from the constitution of the World, whether we consider it according to the Epicurean or the Cartesian Hypothesis of the Origine of things. For the Epicureans supposing this World to be produced

by the casual concurrence of Atoms, and ascribing to every particular Atom an innate, and unlooseable mobility, or rather, an actual motion, or a restless endeavour after it; 'tis consonant to think, that though in Concretions, they so entangle one another, that they cannot in a short time, or a visible manner clear themselves from one another, yet they do incessantly strive to dis-entangle themselves and get away: by which means there is always in the Atoms even of Solid Bodies, actual endeavours of each of the distinct Atoms to extricate it self from the rest: (which endeavours usually at last succeed, whence comes the decay and destruction of Bodies) and in the mean while these perpetual and contrary endeavours produce intestine Commotions in the internal parts of the Body wherein these Atoms were imprison'd.

On the other side according to the Cartesian Doctrine, the *Materia Subtilis*, that constantly passes like a stream through the Pores even of the solidest Bodies, may well be suppos'd in its passage to be continually shaking or otherwise agitating the insensible Particles that make up the body that seems to be at Rest, without discovering their Motion to the Eye: As when in Summer time (to explain my self by a Comparison) a gentle breath of Wind passes through a Grove removed a pretty way off from the Spectator, though his Eye discern no change in the Grove he looks on, yet the Wind as it blows through the Trees will shake some of the Branches as well as the flexible Twigs; and not only blow the Leaves into various postures, but blow some of them quite away.

I might easily enlarge on this Subject, but having elsewhere done it on another occasion, I think it may be now more proper to satisfy some of the Company, who are yet entangled with the same prejudice with many other



other very Learned men, who look upon it as a Precarious and Chimærical Fancy of the Atomists, to imagine, that in Solid, and as to sense, Quiescent Bodies, there should be any intestine Motion of the component Particles, neither the Motions nor the Corpuscles themselves being to be seen, and both of them being therefore as well incredible as invisible.

A solemn Debate of the whole Question about the Minuteness of Atoms belongs not to this place, where it may suffice to answer the Objection.

### SECT. III.

And first, As I have elsewhere hinted, it may appear by divers of the Phenomena above-cited (in the *History of Fluidity*) that when Water and several other Liquors seem to be continued Masses of Matter, and to be as much at rest, as the very Glasses that contain them; their constituent Corpuscles are in an actual and various though slow and unperceived Motion.

Next, That there may be likewise such a Motion in the minute parts of Silver and Iron themselves, may be easily argued, by heating those Metals till they come to be almost red hot: for then though the eye can discern no motion of the Corpuscles those Metals consist of, yet their being able to burn those that hold them in their naked hands, shews that their brisk Motions may be discovered by the help of the Touch; and if you spit upon them the Liquor will boil, as if it were over the fire. And lest it should be objected, that so anomalous and violent an Agent as the Fire, is necessary to these Tryals, I shall add, that, provided the minute parts be sufficiently agitated, it matters not whether the Motion be produced by Fire or no; for by the nimbly hammering of Iron or Silver, you may put the minute parts into such a Motion, as will make the Metal very hot

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to the Touch, and being communicated to Spittle or Water, will excite Bubbles, and scatter the dissipated parts of that Liquor into the Air, in the form of Smoke or Vapours; nay I elsewhere shew how I have easily excited a very sensible, though not a visible agitation, and heat in the internal parts of a Metal, barely by my naked hands, without any external instrument whatsoever.

And whereas it may be objected, that though the Motion already generated is unseen, yet we may discern a change of the component Corpuscles of a Body which are in the Act of altering its Texture, and introducing a new alteration or quality in the Body to be wrought on, or destroying some pre-existent quality: I briefly answer (for I would not here repeat what I have elsewhere said of this point) by this clear Experiment, that though your Eye can discern no change in the outward and visible, much less in the more latent and internal Corpuscles of Iron: a vigorous Loadstone by passing along its Axis from one Pole of the Stone to the other, and back again, yet the Texture of the Iron is by that action of the Load-stone so changed, that it acquires, and then loses those admirable Qualities we call the Attractive and Directive virtue or faculty peculiar to Magnetical Bodies.

And to shew you that the invisible Motions even of Metalline Bodies may be quick and brisk enough, and may be sensible, though not visible; We shall need to consider but the state of a good Bell so long after the Clapper has struck it, that no shaking or other Motion is to be seen in the body of the Bell it self, and yet it causes in the Air an odd kind of ringing, or if I may so call it, undulating Sound or Motion, which will sometimes last a considerable while; and if the Bell be fitted for sharp notes, 'twill not be without a shrillness: for if  
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sounds proceed, as is elsewhere made probable, from the nimble percussions of the Air put into a quick and waving motion by sonorous Bodies; this acuteness of sound will shew, that whilst to the Eye the Bell seems to be at Rest, yet the minute parts of it continue in a very brisk motion, without which they could not strike the air strongly and fast enough to make it produce so shrill a noise in the Ear.

But, I confess to you, that my thoughts present me a Difficulty, which though un-mention'd at our meeting, may afford an Objection, perhaps more difficult than any of (not to say all) the foregoing, namely, That 'tis scarce imaginable, how such solid and hard Bodies should have their internal parts wrought upon by such slight Agents as the air, and perhaps some yet minuter matter that is dispersed in it; and how it is possible, that where there is an actual Motion it should be so slow, that a Corpuscle of Iron, for instance, seated in the internal Part of a Magnetick Needle, should spend so long time as our conjecture requires in travelling so little a space as from thence to the next Superficies of the Needle. But to this double Objection, though some instances which you will meet with in the following part of this Paper, may be properly applyed to solve it: yet not to make your curiosity wait, I will here speak a word or two to each of the members of the Objection.

#### SECT. IV.

And to the first, I say, That these Intestine Motions of the Corpuscles of hard Bodies, need not be solely, nor perhaps principally ascribed to those obvious external Agents, to which we are wont to refer them, since these may but excite or assist the more principal or internal Causes of the Motions we speak of, as you may gather



ther from what was but lately mention'd of the connate and unlooseable mobility of the Atoms, according to *Epicurus*, and the permeation of the most Solid Bodies by the Cartesian *Materia Subtilis*; and we may see by the sudden effects of the Load-stone, in endowing Steel with Magnetick Qualities, and depriving it of them again (both which suppose the intervention of a change of Texture, and this a production of Local Motion in the Metal) that very minute and insensible Corpuscles of matter are not incapable of effecting durable changes in the solideest Bodies.

And as for the other member of the Objection, I confess it is not easie for us who are wont (perhaps too much) to follow our Eyes for Guides in judging of things corporeal, and to deny existence to most things, to most things whereto Nature has deny'd a visible bulk: 'tis not easie, I say, for us to imagine so great a slowness as 'tis very possible for Nature to make use of in her Operations, though our not being able to discern the motion of a shadow of a Dial-plate, or that of the Index upon a Clock or Watch ought to make us sensible of the incompetency of our eyes to discern some motions of natural Bodies, which reason tells us ought to be incomparably slower than these. But not now to dispute about the existence and Attributes of infinite slowness, or at least a slowness in the next possible degree to infinite: I consider that it has not that I know of been demonstrated, nor attempted to be so, that the motion of the Corpuscle, for example of the Needle above mention'd, must be made in a direct line from the place where 'twas first supposed to be to the Superficies of the Needle; for it seems more rational, and to agree better with the Phænomena, to suppose, that the way of this Corpuscle in the Body 'twould quit, is extremely crooked and intricate (almost like that of a Squib in the air, or on the ground) for it being on the one hand



hand urg'd on by the Causes whatever they be that make it strive to fly away, and on the other hand hindred by the Corpuscles whereto 'tis connected, and by the occurrences of other Corpuscles whose motions may be opposite to, or disagreeing with those of our design'd Corpuscle; it may probably, before it can extricate it self, be reduc'd to encounter and wrestle, as it were, with many other Corpuscles, and be by them sometimes thrust or impell'd to the right hand and to the left, and sometimes also repell'd inwards, even after it is come to the superficial part of the Needle; whence it may not presently have the liberty to fly away, but may be drawn back by some other Corpuscle, wherewith it is yet connected, and which happening to be it self thrust inward may draw after it, and so entangle again our almost dis-banded Corpuscle: besides that, the gravity of the component Particles of a Body is oftentimes such, that 'tis easier for the Agent that puts them in motion, to continue them in that slow motion among themselves, than drive them up into so light a *medium* as the air, as experience shews in those Bodies that are called Fixt, as Gold, and Glass, though in actual fusion.

But, I forget that I promis'd you to decline Speculations, and therefore I shall only name to you a couple of Instances which will serve to confirm both what I was lately saying, and what I am now in proving.

#### SECT. V.

The first of these I shall take from what is usually granted as matter of Fact, namely, that if a Spring, though made of so hard a Body as Steel, be forcibly bent, and kept but a moderate while in that posture, as soon as the force that kept it bent is removed, it will again return to its former Figure; but if it be kept too

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long in that forc't position, it will by degrees lose that which they call the motion of Restitution, and retain its new crooked Figure, though the force that bent it be removed; which shews both the power of some of the more familiar Agents in Nature, and (which is that the shewing whereof I here chiefly aim at) that where there is a continued endeavour of the parts of a Body, to put themselves into another state, yet the motion, or rather the progress may be much more slow than men seem as yet to have taken notice of, since 'twas a great while before the Texture of the Corpuscles of the Steel were so alter'd as to make them lose their former springiness.

But I will second this with a more illustrious Experiment, which will at once confirm what I have just now said, and shew that the Air or the invisible Corpuscles harbour'd in it may have no inconsiderable power to act upon, and effect changes in the solidest Bodies.

To this purpose I shall only observe to you, that *though* if a Bar of Iron having one of its ends held perpendicularly, and at a fit distance, to the Lilly or North-Point of the Mariners Compass (I mean that which points towards the North) it will, as I elsewhere mention, drive it away towards the East or West: and if this same lower end of the Bar of Iron be put into a contrary posture, it will presently lose its temporary magnetism, as I elsewhere declare. Yet if this Bar be very long kept upright in a Window or other convenient place, then, as some late Magnetical Writers will tell you, it will have acquired a constant and durable magnetick power. Which is a Phenomenon that makes exceedingly for our present purpose, since it hence appears both that the Air together with the magnetical Effluvia of the Earth that it receives in its Pores, is able without outward force to work durable changes in so solid



solid a Body as Iron, and that the motions of the internal Parts, for these are requisite to the change of the Metal's Texture, are performed with a wonderful slowness, since the Bar must be very long exposed to the air, perhaps before it acquires any durable magnetism at all, but at least before it acquires so vigorous and fixt a magnetism as by this means it may attain to.

But, because most of the Instances to be propos'd in the following part of this Essay, may serve for Confirmations of what we have been discoursing; I shall proceed to them, yet not 'till I have advertis'd you, That I purposely decline to mention divers Phænomena that may even by Learned men be thought fit examples on this occasion, (such as the Nutrition, Growth, and Wasting of Animals and Vegetables) because such Bodies receiving constant supplies of Corpuscles, of several, and often unknown, Natures, there may be difficulties suggested about them, not easie to be cleared without longer Discourses than I can allow this Essay.

## SECT. VI.

The first Instance then that I shall mention about Vegetable substances, shall be taken from *Lignum Vitæ*, or *Guaiacum* (for many Artificers give them the same name, and use them promiscuously for the same purposes,) of which, though it seem to be the solideest wood we know (insomuch that I as wel as some others have ordinarily us'd it to pound solid Bodies in) yet the skilfullest Tradesmen I have met with, have upon my inquiry informed me, that if it be wrought before it be well season'd by length of time, it will shew it self very frangible; which an eminent Turner told me he had often found to his loss: For having turn'd divers fine pieces of Work of *Lignum Vitæ*, before 'twas duly season'd, he found almost all



of them by the heat of the Sun (which the uses of many of them requir'd they should sometimes be expos'd to) crack, and cleave asunder, into I know not how many parts; whereby those fine pieces of workmanship were quite spoil'd. And I remember, that having enquir'd of an old experienced Tradesman, of whom I bought an excellent Mortar of *Lignum Vitæ*, how long he had kept the Wood in seasoning before I had the Mortar, he answered me (if I much mis-remember not) 20 years, under which time it is not fully season'd for some purposes; of which opinion of his, having occasionally spoken to the lately mention'd Turner, this experienced Workman much confirmed me in it; as he likewise did in an Observation I not long since made about the slow and unperceived motion that may be, not only in the more loose and fugitive Aqueous parts of *Lignum Vitæ*, but in far more unlikely ones. For he told me that he had often found, in Turning that Wood, Cavities of several sizes in the very inward and solid part of the Wood (which every way encompass'd them) and in those Cavities considerable quantities of a certain Gum, much cryed up by some for an Anti-Venereal Medicine.

The use I would make of these Examples is this, That since so solid a Body as a Trunk of *Lignum Vitæ* is, when the Tree is newly fell'd, may require so long a time as 20 years, or upwards, to be seasoned (*i. e.*) brought to its full compactness and toughness; and since the account upon which time seasons Wood seems to be this, That by degrees the looser Aqueous, and more fugitive parts exhale into the air, whereby the remaining solid ones are brought into a closer order, and have leisure to be so placed among themselves, as is most convenient to make their Texture firm and durable: it will follow, that even in the internal parts of this solid Wood there must be, not only in the looser and lighter Corpuscles, that  
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extricate themselves, and exhale away, a true local motion, though much too slow to fall immediately under the discernment of our senses. And, if the lately mentioned Gum be either totally, or so much as in part generated, as to sense, after the felling of the Tree, as some Analogous Instances that I have elsewhere taken notice of, make it probable; then the Example will further be considerable to our present purpose, by shewing that a substance so gross, and so little volatile in comparison of the Aqueous parts, as is the brittle Gum I speak of, may permeate to a great thickness, a very solid and inanimate substance; which cannot be done without an intestine, though insensible motion among the parts of the Wood, and probably a marvellously slow motion of those of the Gum.

## SECT. VII.

But it will possibly seem more strange, that very thin pieces of Wood, and those saw'd off from a Tree of a much looser Texture, should be much longer in seasoning than that solid and ponderous Wood we have been speaking of. And indeed this discovery is not to be made, as in *Lignum Vitæ*, by the brittleness, or other obvious qualities in the Wood, but by a subtler way; and accordingly having purposely consulted with the Makers of Musical Instruments, and with some ancient Musicians, I was much confirmed by them in my opinion: And I remember, the last Maker of Viols, Lutes, &c. of whom I enquired of what Age he thought such Instruments, especially Lutes, ought to be to attain their full and best seasoning for sonorousness; he reply'd, that in some of them 20 years would be requisite, in others 40, according to the nature and thickness of the Wood, and other circumstances. But an Ancient Musician that was present



present at what was said, inform'd me that there were some famous Lutes, one or two of which he nam'd to me, that attained not their full seasoning and best resonance till they were about fourscore year old. And thus much for inanimate Vegetable substances.

## SECT. VIII.

As for calcin'd Stones made up into Lime, and sorts of raw stones, I have already observed from the credible relations of Masons and others, that the Walls in some Buildings attain not their hardness and solidity till they are 40 years old, or perhaps much ancients; and since in gradually proceeding to this degree of solidity, these Walls resemble the seasoning of *Lignum Vitæ* formerly explicated, the motion of the internal parts may be argued from the change of Texture as well in these as in that.

And, if I would rob other Tracts (to which they more properly belong) I could here easily adde some such Instances of the hardening and softning of Stones by time, as would much confirm what I have now been delivering; but I shall rather chuse to confine my self here to the two Examples following, not taken notice of in Quarries or by Masons.

The first is, That there are Marchasites, consisting as well of a stony as of a metalline substance, which, though harder than many other sorts of Stones, and even than Marble, have yet so great a motion in their internal parts, that if they be expos'd to the air, not only they will have a Vitriolate Efflorescence, if I may so speak, on their superficies (as I have observ'd in divers other Marchasites) but they will in Tract of time burst the Stone in Pieces; of which sort I had some time since, and I hope I have yet a bulky Marchasite that I procur'd from



from a Virtuoso that lives just by a Vitriol-work, whether these among other Vitriol-Stones are brought, and where this Stone being chosen for its largeness, was taken up and carefully kept by that ingenious person till it burst of it self, and till I sent for it. And to satisfy myself a little further, that the internal parts of Marchasites may be as well dispos'd to be vitriolated as the external; I remember I broke a hard Marchasite that I had from another place, and laying it some short time in a Chamber-Window, I found the new superficies made by the Tracture about the middle of the Stone to have acquired an Efflorescence of a vitriolate Nature.

The other instance, which is very odd, and much talked of, is this: An ingenious Gentleman of my acquaintance, casually meeting me one day, told me that he had a Turquoise-stone, which if he were not mistaken had a wonderful property, for there being in it several spots of Colours differing from the rest of the Gem, these spots seem'd, though very slowly, to move from one part of the stone to the other. And this he thought himself to have taken notice of for very many Months (perhaps a couple of years). This Relation seem'd so strange that the Relator was not at all surpriz'd, when to ascertain my self of the truth of it, I desired to have the Ring this stone was set in, for a while in my own keeping, to which he readily assenting; besides that I took very heedful notice of the situation of the spots, I employ'd a very ingenious youth that then lived with me, and was skill'd in drawing, to make the Picture of the stone with the spots as they were then placed, and afterwards to have a watchful eye upon it, and from time to time (as once perhaps in two or three weeks) to draw a new Picture of them; by comparing several of which Pictures, it was unanimously concluded that the spots did shift places in the Turquoise, as if the matter they consisted of  
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made its way through the substance of the stone: As we lately noted that the Gum of *Lignum Vitæ* seem'd to do through the substance of the Wood: And as far as we observ'd, the motion of these spots was exceeding slow and irregular, though perhaps it might have been reduc'd to a somewhat less uncertainty, were it not that by an unwelcome accident we were deprived of the opportunity of continuing our Observations long enough. And this brings into my mind, that the Turquois being a stone, of which I had met strange stories in good Authors, I once asked several questions about it, of a noted Jeweller; and enquiring among other particulars, whether he had not observ'd some changes that seem'd spontaneous in the substance or colour of the stone? he reply'd that in some few Turquois's he had observ'd two differing Blews in differing parts of the same stone, and that one of those Colours would by slow and unperceiv'd degrees invade, and at length overspread that part of the stone, which the other Colour possessed before. I shall here add, that the same Gentleman that lent me the spotted Turquois, shew'd me afterward an Agate Haft of a Knife, where was a certain Cloud, which he told me an ingenious Person had for some years observ'd to remove to and fro in the stone, and had a while since to convince the Relator lent him the Agate, of whose Phenomena he promis'd me an account, when he shall have had the stone in his custody for a competent time, till the expiration of which, it may suffice to have said of this Agate what I have now related.

#### SECT. IX.

But because that Diamonds and Glass are generally looked upon, especially by Chymists, as Bodies of the closest and firmest Texture that Nature and Art afford,  
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if we could shew an intestine motion even in the parts of these; fitter Instances for our purpose could not in reason be desired: I shall venture to say something of each of them, though what I have to say about Diamonds, is propos'd rather to ground a suspicion of what may be, than a demonstration that it must be.

In the first place then, to remove that prejudice that may be entertain'd from the incomparable hardness of Diamonds (which I confess experience has made me admire) as if Bodies so hard and solid could not have their parts put into motion but by some extraordinary, not to say, prodigious force; I shall only repeat here what I have elsewhere shewn, that Diamonds are Bodies that easily enough become actually-Electrical, and that some Diamonds (of which sort I have a small one by me) will by rubbing upon a cloath be brought to shine in the dark, the Quist of both which transient Qualities requiring a change of Texture even in the internal parts; and the Friction that produces that change, doing it immediately by putting the parts of the stone into local-motion, it may be thence argued, that a very moderate force may suffice to beget an internal motion in the inward Particles of Diamonds themselves.

And I am not sure but that more hidden Agents may make impressions upon these hardest Bodies. For in a Ring that I am wont to wear on my little Finger, which has no Diamond, save one more than that shining one I lately mention'd, I have I know not how often seem'd to my self to observe a manifestly greater clearness and sparklingness at some times than at others, though I could not refer it to the clearness or dulness of the weather, the moisture or driness of the air, the superficial clearness or foulness of the stone, or any other manifest

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cause I could think of. And in this I was the more inclin'd to think I might not be mistaken, because, besides that the notice I took of it, was frequent, I have by me a rough Diamond just as it came from the Rock, in whose Electrical faculty I have taken notice of changes as to the degree of strength wherewith it attracted, and that within the compass of a very little time, though I could not find any cause whereto I could refer so surprizing a Phenomenon. And I must not here omit, that chancing one day to shew the newly mention'd Diamond Ring to a very ingenious Lady that used to wear in Rings and Bracelets store of those Gems, and telling her what changes I had taken notice of in the Diamonds; she who had observ'd more about Gems than any Lady I had yet met with, appeared but little surprized at what I told her, and affirm'd to me that she had divers times observ'd the like alterations in some Diamonds of hers, which sometimes would look more sparkingly than they were wont, and sometimes far more dull than ordinary. And when I objected, that possibly that dulness might be imputed to the weather, or some casual foulness of the surface of the stone, she reply'd that she had been aware of those circumstances, rubbing the stones clean, and otherwise taking care to secure an Observation, which she had made too often to have deceiv'd her self in it. If I remember aright, I have elsewhere mention'd how I saw a considerable, but Cloudy, *Hungarian* Diamond, which the Owner would have presented me, made clearer by lying for some time in a cold Liquor, wherein he affirmed that upon his keeping it longer the stone would lose more and more of its cloudiness; and what I my self saw suffic'd me to argue, that changes may be produc'd even in the inward parts of such Diamonds by Agents that act without any appearing Violence.

## SECT. X.

And if it be true that Diamonds, as I elsewhere observe about many other stones, may be generated from time to time in the bowels of the Earth, it may not perhaps be absurd to imagine, that even true Diamonds, that seem perfect, and are fit for Rings, may long continue to have an insensible motion through the whole stone, whereby the Corpuscles it consists of are dispos'd into a more convenient Texture for the constituting of an extreamly hard body. For though it be taken for granted, that Adamantine Bodies, because they are generally exceeding hard, are equally so, yet that supposition is not favoured by Experience. And I remember, that to satisfy my self further about such matters, I repair'd to an ancient Artificer eminent in his Trade, which was the cutting and setting of Diamonds, and that having demanded of him whether he found that all Diamonds were of equal hardness; he answered me, that having dealt in these Gems near 20 years in *Amsterdam*, and divers years in *England*, he perceived that there are of later years brought over worse and worse sorts of Diamonds, and that he finds several of the recent Diamonds so soft and brittle in comparison of those he was anciently wont to set (and which he with other Jewelers called Diamonds of the old Rock) that he is often afraid, and unwilling to meddle with them, when they are brought to him, lest he should spoil them in the cutting, or polishing. But this I only repeat historically, till further observation shall discover whether these are Diamonds not yet fully ripe, and capable of growing harder by further maturation, or whether they be of a peculiar sort of Diamonds whose nature it is to be always softer than those of the old Rock.



## SECT. XI.

This brings into my mind a confirmation of the unequal hardness of Diamonds, whatever be the cause of it, which I met with in a little Book lately Published in his own Language by a Frenchman, who giving his Reader an Account of the Eastern Diamond-Mines from the Relation, as he affirms, of a late Eye-witness, speaks thus of the third and last Mine called *Gazerpoli*; *They are very clear, and of a good Water, but they cannot be ground by mutual Attrition* (if I understand the Term he uses) *but with stones of the same Mine; for if one should employ for that purpose the stones of another Mine, those of Gazerpoli would be broken in pieces: They do also easily break upon the Wheel, and those that are not vers'd in the knowledge of stones may easily be deceived* (in them.) Of which our Author adds the Example of a *Portuguais*; who refusing 1200 Crowns for one of them at *Ligorn*; when he went to have it cut at *Venice*, it broke upon the Wheel into fifteen or twenty pieces.

*Egrezes*, pag.  
m. 17-18.

Another Example that seems to make more for our present purpose is afforded by the same Author, speaking of the second Mine, which breeds the greatest stones called *Gane* or *Colonor*; for he says, that *sur la plus part*, i. e. upon the most of these stones after they are cut, there appears always as it were a kind of greasiness or unctuousity, which invites you ever and anon to have recourse to your Handkerchief to wipe it off; which one would guess to proceed from some insensible Effluvium; that exhaling out of the stone comes to be check'd and condens'd by the air on the superficies of it, as it happens to sweat on the skins of Animals: the truth of which conjecture I would examine by very nice scales, if I could procure such Diamonds.

SECT.



## SECT. XII.

And because Rubies, though inferior in hardness to Diamonds, are yet harder than most other Gems, and much more than Marble and the like courser stones, I will not omit on this occasion, what was more than once affirmed to me by an observing Lady, whom, if she were not too nearly related to me, I could scarce mention without an Elogy. For casually casting my eye upon a fair Ruby she wore upon her finger, and desiring to consider it more attentively, she pull'd off the rich Ring 'twas set in, and reaching it me, told me 'twas worth my curiosity to consider it. For besides that 'twas so fine a stone, that 'twas thought worth being left her as a Legacy by a great Lady (her dear friend) that was famous, as I knew, for the variety of the rich Jewels she was Mistress of; this Ruby would not unfrequently vary the degrees of its lustre she knew not why. For sometimes it seem'd to be ennobled by a more vivid fire than ordinary, and at other times it would be manifestly more dull and cloudy than 'tis wont to be: and this not imputable, as she expressly assur'd me upon repeated Observations, to the Cloudiness of the Weather, or any superficial foulness of the stone. And that I might be convinc'd as well as she her self was, she desir'd me to rub it very clean, and then take notice of the present lustre of it, of which e're long she presum'd she could shew me a manifest alteration (for I was then come to visit her and pass some weeks with her in her house) but my occasions calling me away within a few days after, I had not time to wait for the event of her promise.

How far what has been said concerning Diamonds may be allowed to be Argumentative towards the scope of this Discourse, I shall willingly leave to the discovery

of

of time, and further Observation; the mention I have made of the foregoing particulars, having been invited partly by the nobleness of the subject, which made me willing to adde these Relations to what I have elsewhere written about them; and partly because thus much at least seems probably deducible from what I noted about the exciting of Diamonds by rubbing, both to attract, and to shine, that notwithstanding their incomparable hardness, an intestine motion of their minute parts may be without any considerable violence quickly produc'd.

### SECT. XIII.

And now 'twill be time to consider the other Body I promis'd to take notice of, namely Glass. For this being thought so compact and firm a Body, that 'tis indistructible by Art or Nature, and being also of so close a Texture, that the subtlest Chymical Spirits (that are yet known) cannot pervade it, and lastly having given such proofs of the fixedness of its parts, as to have long endur'd the violence even of a Glass-house-fire, we can scarce imagine a Body more unlikely to have any motion amongst its component Particles: and yet that they may not be always at perfect Rest among themselves, I have been induced to think by the following, and the like Observations.

First, having enquired of a famous and experienced Maker of Telescopes, as well as of those that use such Instruments, whether he did not observe that the Venice-Glasses he employed would sometimes crack of themselves whilst they were yet in Plates, and sometimes do the like after they were ground into Convexes, and polished up; he answered affirmatively. And though it seem'd improbable that Glasses brought so  
far



far off as from *Venice*, and many of them kept a good while here in *England* before there be occasion to grind them: and perhaps longer after their having been ground before they crack, should after all this time retain an internal motion among their component Particles: yet I have been induc'd to conjecture that some saline Corpuscles more numerous than the Nature of the Glass requir'd, may, by degrees though slow and unperceiv'd, so tend towards the superficies of the Glass, as either to get out of the Pores of it, or crack, or burst the Glass in endeavouring to force their passage outward. For having purposely enquired of the above-mention'd Artificer, and some other observing men that deal in Optical Glasses, whether it had not been taken notice of, That there would sometimes be, especially in Winter and very moist Weather, a kind of Efflorescence of a saltish taste manifestly discernable upon the surfaces of their Glasses; I was answered in the Affirmative, especially by the above-mention'd Artificer, who having more occasion and opportunity to take notice of such things, told me that he had by tasting found these Exsudations sensibly saltish.

#### SECT. XIV.

And I was the more apt to entertain the lately propos'd Conjecture, because of a thick Glass Cup that I have yet by me, in the making of which, to render it the more Diaphanous, I suppos'd an over great proportion of Salt had been employed. For this Cup though for a while it continued clear and entire, yet before the ensuing Winter was ended, though it did not so crack as to fall to pieces, but still retains its former shape, yet it was flaw'd with such a multitude of little cracks,



cracks, that at a distance it looks like a White, not like a Christalline Cup.

## SECT. XV.

I remember also that I have sometimes, though not often, had Vessels and other Bodies of Glass of a considerable thickness, which have of their own accord broken suddenly asunder, with noise enough to make me take notice of it. And that this did not always happen for want of the Glass's being gradually or slowly cool'd, or, in the Workmens Language, Neal'd, I was perswaded not only by the spontaneous cracking, not without a loud noise of a thick and empty Glass Vessel, that had for I know not how many Months been kept locked up in my Study; but by the like Accidents, which I after found had happened unto others. For enquiring of some that made great store of Glass Vessels, as well as of others that sold them; I learned from both, that they had sometimes by their losses been made to take notice that Glasses that had been long made, and kept unemployed would break of themselves, when there was no visible outward Agent near enough to be suspected of the having broken them. And since this very Page began to be written, I had a fair Christal Vial, not too well stoppt, which crackt at the thick bottom, in a Glass Cabinet (that was fixed to a Wall) where I kept that with other choice Vials under Lock and Key; no other of the included Glasses (full nor empty) nor yet of the external Glasses appearing any way crackt or injured. Nay even great and strong Looking-Glasses are not quite exempted from these accidents. For I remember that having purposely enquired of an honest man that furnished the greatest part of *London* with large Looking-Glasses,

Glasses, whether he did not sometimes find them crack, and that with noise; he show'd me divers large Plates of excellent Glass, and assured me, that sometimes after they had been a good while in his Shop, some of them would of themselves, not only crack with a loud noise, but now and then also ( though rarely ) fly asunder with that violence as to break some of the neighbouring Plates though thick and strong.

### SECT. XVI.

And having also a mind to enquire further, whether this disposition to break in some sorts of Glass, might not continue much longer than I had opportunity to observe, I address'd my self to an ingenious Master of a Glass-house, and demanded of him how long he had taken notice of Glass to continue sound and whole, and yet afterwards to break of it self. He replyed that he had once a great parcel of Glasses packed up, which not having the occasion he expected to vend and make use of, lay by him for a great while; and yet when afterwards he had unpack'd them, and rang'd them, in a short time a great many of them, amounting to about a fourth or third part of the whole number, cracked of themselves; and when I asked how long the Parcels had lain by before they were opened, he replyed, that 'twas as he remembred between four and five years.

## SECT. XVII.

These Instances (to which I could adde divers others) I have therefore mention'd because either of the two Hypotheses in congruity whereunto they seem likeliest to be intelligibly explicable, will favour the Doctrine hitherto patronized. For according to the Atomical Theory, it may be conceived that there is a constant intestine Motion of the small parts of the Glass upon the score of their constituent Atoms, which endeavour or tend to extricate themselves and get away, which at last they do, by breaking the Glass in some brittle, or other fit place; where (after a multitude of encounters and evolutions) a competent number of them may happen to be got together, and find their Motion (outwards) withstood: whence may ensue so unequal an agitation there, of the formerly coherent parts of the Glass, as to make the more agitated ones part from them that are less so; and consequently crack the Glass. To which agrees what I have often observ'd in Chymical and Mechanical Tryals made with Glass-Vessels, That if there be any grain of Sand or Gravel, or any little Lump of the Alkalizate matter Glass is made of, conspicuously inclos'd in the substance of the Vessel, 'twill both be much the more apt to break, and if it do, will almost always begin to crack at that place, (whence usually as from a Center several cracks go several ways) the part of the Glass where the blemish is, being commonly of a differing Texture from the rest (as is often manifest to the very eye) and being by that incongruous Texture disposed to be put into a motion differing



differing from, and perhaps very disproportionate to that of the neighbouring Parts.

### SECT. XVIII.

I must not here stay to examine, whether or no this motion of the internal parts may not (in divers cases be made more efficacious by the penetration of some subtle and moist matter into the Glasses Pores, (especially the more superficial ones of some Glass of a looser sort) and so by degrees vitiate the Texture of the Body, and promoting the Agitation and swelling of the saline Corpuscles, enable them to burst the Glass, after some such manner as the Marchasites I lately mentioned, came to have a vitriolate Efflorescence, and even to be burst by the operation of the Air; this, I say, I must not now stay to examine, because I would hasten to propose the second Hypothesis, and tell you that (else) we may, congruously to what we elsewhere discourse, imagine, That in tract of time, there is produced in some parts of a Glass a Texture that makes it resist more than it did formerly the free passage of the Æther, or some other subtle matter, that was accustomed (perhaps stream-like) to permeate it before; which transient matter now finding its passage obstructed (and perchance almost quite hindered) by the vitiating of the Pores of the Glass, or some other (inconvenient) change of Texture in it, and endeavouring to continue its wonted motion through it, does so stretch the Pores, or otherwise offer violence to the Texture of the Body, that it causes a divulsion in

the parts, which according as it is more or less forcibly or suddenly made, does either barely crack the Glass, or make it flye asunder. To the precedent Doctrine these two things agree not ill: The *First*, That Glass is a Body easily made Electrical by rubbing, which makes it probable that its Particles may easily be put into motion. And the *second*, That such a Divulsion may be made in Glass by but an inequal motion between the neighbouring parts; as may appear by the Chymical practice of cracking Glasses, which they often think fit to do, only by applying a red hot Iron to the place till it be sufficiently heated, and whilst it is very hot, moistening it with cold water (or even Spittle) which by cooling the part that it touched, and consequently checking the Agitation of the Corpuscles it meets there, whilst the contiguous parts retain their former vehement Agitation, occasions a discontinuity or divulsion in the Glass, some of whose parts are in so swift, and others are in so slow a motion.

### SECT. XIX.

And on this occasion I shall adde chiefly, because I would not pretermit so considerable a Phenomenon, That even when Glass seems to have lost the degree of heat that one would think necessary to have its shape or bigness sensibly alter'd, there may remain yet so much agitation in the minute parts, as, when they are modify'd by the Air, by the Cold, or by some other invisible Agent, to make them alter the bulk or shape of the whole Vessel they compose; and that (which one would not expect) by enlarging

larging the Vessel, at least if we allow not in the case any change of Figure: For it has often been observed in those Glass-houses where they work White Glasses, as they call those that are pure and clear, that when they have blown Glasses into a mold, to give them more exactly the desired shape and size, these Glasses when they are cold cannot well be put again into the same mold they were blown in, and require that the Cells of Garde Vials that are to receive them be made a little larger: which Observation an eminent Artificer of my acquaintance that gets considerably by fitting fine Glasses to Cases; has much confirm'd to me by his complaints of the inconvenience, easie to be incurr'd, by the not knowing, or not remembering so unlikely an Effect of the cooling of Glass. But I must not prosecute the consideration of these, and the like Phenomena, nor examine which of the preceding Explications is preferable, having mention'd them, as I was saying, chiefly to shew, that which of them soever we pitch upon, it will argue an intestine motion in the Corpuscles of the Glass, which motion we shall think may be very slow, if we consider how long a time it is on some Occasions in producing its effects before it brings them to be discernable to our senses.

## SECT. XX.

Having thus made it probable, that among the parts of such solid Bodies, as I have hitherto instanced in, there may not be such a perfect Rest, as is generally believed; it will I suppose be expected that I should now draw this consequence from what has been said, That there is no such thing as absolute Rest



Rest in Nature. But since at my first mentioning this Paradox to you, I proposed it but as Problematical, and since I consider that we are not yet sure, but that though many of the parts of solid Bodies may not be *always* moveless, yet some others of them may *sometimes* for a while at least be at perfect Rest: I shall conclude as I began, and without resolutely denying that there can be any such thing *in rerum naturâ*, as absolute Rest, I shall content myself to say, That 'tis not either absurd, to doubt whether there be or no; nor improbable to think that there is not, since we have not found it in those very Bodies, where with the greatest likelihood it might have been expected.

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FINIS.

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